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ABSTRACT

This digest addresses the needs of homeschooling parents teaching science. National and state science standards documents are recommended for deciding what students need to know and should be able to do at different age levels. Sources of science lessons and activities are provided. Science reference materials such as books, magazines, and instructional television programs are recommended. Consideration is also given to the use of public libraries, parks and museums, and Internet resources as science content references. Enrollment in occasional public school science courses or distance learning opportunities are considered as possible resources for homeschooled children. A list of Internet resources for science teaching is included. (WRM)

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May 1999

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If your child is among the 700,000 to 1,150,000 currently being schooled at home in the United States (Ray, 1996), you may have questions about the science he or she should be learning. Though children schooled at home perform quite well on achievement tests and are often placed at higher grade levels than their peers in school, (Rudner, 1999), decisions have to be made about the specific science skills and content to be learned. Parents who are looking to the future and are emphasizing math, science, and reading proficiency (Rieseberg, 1995) will want to align their home school programs with professional, state, and national standards.

Meeting Standards

The *National Science Education Standards* (National Research Council, 1996) present an outline of what students need to know, understand, and be able to do at different grade levels to be considered scientifically literate. The *Standards* are having a strong influence on state curriculum frameworks and proficiency tests, so aligning science learning in the home school with the national standards will provide students with the preparation they need to enter high school or college with science backgrounds comparable to their peers who attended public schools. Another good guide, the *Benchmarks for Science Literacy* (American Association for the Advancement of Science, 1993), provides specific goals for learning in science, mathematics, and technology by the end of grades 2, 5, 8, and 12. Schools around the country have used the *Benchmarks* to fashion their science curricula around topic areas that where first presented in *Science for all Americans* (1989).

Other good sources of curriculum ideas are the individual state science curriculum frameworks. These frameworks suggest what concepts and skills should be developed by school science programs, and they define the topics, skills, and concepts covered on state proficiency examinations. For an example see *The Science Activities Manual: K-8*, developed to support adoption of the Tennessee Science Curriculum Framework: K-8 (See online at *http://www.utm.edu/departments/ed/cece/SAMK8.shtml*). Also, many county and local school districts have developed K-12 science curriculum guides for parents schooling their children at home.

Sources of Lessons and Activities

Most homeschoolers use commercially developed science teaching materials. These materials are often available directly from the publishers and provide all of the necessary materials to study particular concepts on specific topics. Since they are self-contained units, they are fairly easy to use. The lessons usually include hands-on activities using materials that are easily found around the home. These materials may not, however, be well aligned with the national or state standards for science education.

Other publishers such as TOPS Learning Systems (See online at *http://www.topscience.org*.) provide science curricula on specific topics, such as magnets or light, that can be easily investigated by students. Each lesson includes hands-on activities which put the student in direct contact with the phenomena being studied.

A good source of information about simple activities and tips for doing science with children is *Helping your child learn science*, produced by the U.S. Department of Education and available online at *http://www.ed.gov/pubs/parents/Science/*.

Other good sources of science activities and concepts include the many books written by Vicki Cobb and Janice Van Cleave. Each book provides ideas, activities, and experiments which can be performed at home and if desired, developed into larger, more comprehensive lessons. Other good activity sourcebooks include *Explorabook: A Kid's Science Museum in a Book*; *Exploratorium Snackbook*; and the *NatureScope Activity Books* (by the National Wildlife Federation). Finally, there are many lessons and activities online, many of which have been identified in another ERIC Digest, *Using the Internet to enrich science teaching and learning*, availabe from ERIC/CSMEE [(800) 276-0462] or online at *http://www.ericse.org/digests.html*.

Reference Materials

Teaching science at home requires the availability of several quality reference materials. Williams (1995) suggested that reference materials found in the home library include a set of encyclopedias either in book form or on CD-ROM, a current atlas and globe, an almanac, a science timeline such as *Timetables of Science*, and several reference textbooks on the science topics being studied.

General reference books can include materials such as *ZooBooks* (which study different families of wild animals with each issue), regular education science textbooks, *Ranger Rick*, *Your Big Backyard*, *Time-Life* books, *I Wonder Why* books, *Read About* books, *Just Ask* books, *Golden* books, *National Audubon Society* books, *Peterson Guides*, *Learn to Read/Read to Learn*—Science Series, and *Golden Guides*. Other suggestions about what to have available in the home are provided in another ERIC Digest, *Helping your child with science*, available from ERIC/CSMEE [(800) 276-0462] or online at *http://www.ericse.org/digests.html*.

Other useful reference sources include magazines such as *Discover*, *Scientific American*, *Science Weekly*, and *Popular Science*. Many television programs also investigate scientific concepts and often suggest or provide activities for viewers to do at home. Often, they also demonstrate many phenomena that are not easily studied at home or school. Popular programs include *NOVA*; *Bill Nye, the Science Guy*; *Scientific American Frontiers*; *Beakman's World*; *Newton's Apple* and many *National Geographic Specials*. For families with access to cableTV, the Learning Channel and the Discovery Channel are also good supplements to science study.

Program guides are available for much of the daytime programming on public television stations. These guides present an entire school year's program calendar and often provide dates and times for block feeds of entire science series. Several instructional programs

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have instructor information available, including discussion items, questions, activities, supplemental readings, and evaluation materials.

The local library, of course, is one of the best places for homeschoolers to find reference materials. Public libraries provide a wealth of science reference information, and many libraries supply free access to the Internet. The library is a valuable source of activities and materials which can complement the homeschooling curriculum. Libraries often provide story hours; career and college information; magazines, journals, and activity books; access to curriculum guides; speakers; displays; globes, charts, and maps; volunteer programs; interlibrary loan materials; and computer hardware and software.

Also available at many libraries is access to the ERIC database. Contained within the database are thousands of citations and documents related to lessons and activities on science topics ranging from preschool to post-college. The ERIC database can also be accessed online through the World Wide Web at *http://www.accesseric.org/searchdb/searchdb.html*. Parents with questions about science activities or curricula can obtain help in searching the database by contacting the AskERIC website at: *http://ericir.sunsite.syr.edu/*. ERIC also has a webpage with pointers to science lessons at: *http://ericir.syr.edu/Virtual/Lessons/Science/index.html*. More information and links to science resources can be found at *http://www.ericse.org*.

Other sources of local science information and activities include aquariums, arboretums, natural history museums, regional science centers, local parks, nearby streams and lakes, state and federal parks and forests, and state historical society centers. Sometimes local businesses and factories conduct tours of their plants which can provide a wealth of first hand knowledge about science and technology.

It would seem particularly important for those schooling their children in the home to provide a personal computer equipped with a CD drive and Internet access. There are many commercially available CD-ROM discs containing science activities and computer simulations. Some computer simulations allow students to perform experimental methods and practice their science process skills. Access to the Internet allows students to research hundreds of topics and find additional activities to perform and investigate. Selected sites are listed below, and links to many more can be found online at *http://www.ericse.org*. Sites are also available where students can pose questions to working scientists who personally answer the questions. Although not the complete answer to homeschooling in science, Internet access can greatly increase the amount of science information available to students.

Another homeschooling strategy that is growing in popularity is distance learning over the Internet. Each student becomes affiliated with a larger group that includes a facilitator who guides the students through lessons. With this arrangement, students are able to ask questions which are answered immediately by the facilitator. This method is also popular because the parent is no longer the only adult responsible for the children's learning and course completion (Natale, 1995). As use of the Internet for distant learning becomes more widespread, additional distance learning options will surely develop.

Another resource available to children schooled at home in most states is the local public school. Students can attend selected classes during the day or use the school library for reference materials. If a homeschool facilitator feels unable to adequately cover a particular curriculum subject, he or she may elect to have the student attend the local public school for the relevant course.

Selected Internet Sites For Science

ACCESS ERIC—Information on the ERIC system and brochures on homeschooling in general.
http://www.accesseric.org/resources/parent/parent.html

ERIC Clearinghouse for Science, Mathematics, and Environmental Education
http://www.ericse.org

The Eisenhower National Clearinghouse for Mathematics and Science Education
http://www.enc.org/

Exploratorium Home Page
http://isaac.exploratorium.edu

Science Friday Kids Connection
http://www.npr.org/programs/sfkids/

Math and Science Gateway
http://www.tc.cornell.edu/Edu/MathSciGateway/

Robert Krampf's Science Education Company—Activities and links.
http://members.aol.com/krampf/links.html

The MAD Scientist Network
http://www.madsci.org/

The Science Spiders
http://www.sciencespiders.com/TheScienceSpiders/scinet.htm

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